Figure 1

Software 180 Implementing Multi-
Resolution Coding and/or Decoding
Techniques

Inventor (s): Holcomb et al.
Date of Deposit: August 19, 2003
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Title: MULTI-RESOLUTION VIDEO CODING AND DECODING
Attorney Matter No.: 3382-65017/KBR
Page 2 of 10

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Figure 2

200

Current frame 205 → Resolution converter 210 → Multi-resolution parameters 215

Reference frame 225 → Resolution converter 230 → Other encoder modules 240 → Motion vectors, residuals, etc. 245

Figure 3

300

Current frame 305 ← Resolution converter 310 ← Decoded frame 315

Multi-resolution parameters 315

Reference frame 325 → Resolution converter 330 → Other decoder modules 340 ← Motion vectors, residuals, etc. 345

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Page 3 of 10

Figure 4

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Page 4 of 10

Figure 5

```
                    ┌─────────────┐
                    │    Start    │
                    └─────────────┘
                           │         510
                           ▼
                 ┌───────────────────┐
                 │   Set resolution  │◄──────┐
                 └───────────────────┘       │
                           │         520     │
                           ▼                 │
                 ┌───────────────────┐       │
                 │   Decode current  │       │
                 │       frame       │       │
                 └───────────────────┘       │
                           │         530     │
                           ▼                 │
                      ◇─────────◇     No      │
                     ◇  Done ?  ◇────────────┘
                      ◇─────────◇
                           │
                          Yes
                           ▼
                    ┌─────────────┐
                    │     End     │
                    └─────────────┘
```

500

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Page 5 of 10

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Figure 6

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Page 6 of 10

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Figure 7

700

Start

710

I-frame
or P-frame?

P-frame

730

Set reference
frame resolution

I-frame

720

Set current frame
resolution

740

Decode current
frame

750

Done ?

No

Yes

End

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Page 7 of 10

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Figure 8

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Page 8 of 10

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Figure 9

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Page 9 of 10

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Figure 10

1000

```
AW1 = 70
AW2 = 5
AW3 = -11

downsamplefilter_line(x[])
{
    y[0] = (((x[0] + x[1]) * AW1 + (x[2] + x[0]) * AW2 + (x[3] + x[1]) * AW3+ RND_DOWN)
>> 7)

    for(Int j = 2 j < Nu -2 j += 2) {
        y[j] =  (((x[j] + x[j+1]) * AW1 + (x[j-1] + x[j+2]) * AW2 + (x[j-2] + x[j+3]) * AW3 +
RND_DOWN) >> 7)
    }

    y[Nu-2] =  (((x[Nu-2] + x[Nu-1]) * AW1 + (x[Nu-3] + x[Nu-1]) * AW2 + (x[Nu-4] + x[Nu-
2]) * AW3 + RND_DOWN) >> 7)

    for(j = 0 j < Nu j+=2) {
        x[j] = CLIP(y[j])
        x[j+1] = 0
    }
}
```

Figure 11

```
SW1 = 28
SW2 = 6                                    1100
SW3 = -3
upsamplefilter_line(x[])
{
    y[0] = ((x[0] * SW1 + x[0] * SW2 + x[2] * SW3 + x[4] + RND_UP) >> 5)
    y[1] = ((x[0] * SW1 + x[2] * SW2 + x[0] * SW3 + x[2] + RND_UP) >> 5)
    y[2] = ((x[2] * SW1 + x[0] * SW2 + x[4] * SW3 + x[6] + RND_UP) >> 5)
    y[3] = ((x[2] * SW1 + x[4] * SW2 + x[0] * SW3 + x[0] + RND_UP) >> 5)

    for( j = 4 j < Nu - 4 j += 2) {
        y[j] = ((x[j] * SW1 + x[j-2] * SW2 + x[j+2] * SW3 + x[j+4] + RND_UP) >> 5)
        y[j+1] = ((x[j] * SW1 + x[j+2] * SW2 + x[j-2] * SW3 + x[j-4] + RND_UP) >> 5)
    }

    y[Nu-4] = ((x[Nu-4] * SW1 + x[Nu-6] * SW2 + x[Nu-2] * SW3 + x[Nu-2] + RND_UP)
>> 5)
    y[Nu-3] = ((x[Nu-4] * SW1 + x[Nu-2] * SW2 + x[Nu-6] * SW3 + x[Nu-8] + RND_UP)
>> 5)
    y[Nu-2] =  ((x[Nu-2] * SW1 + x[Nu-4] * SW2 + x[Nu-2] * SW3 + x[Nu-4] + RND_UP)
>> 5)
    y[Nu-1] = ((x[Nu-2] * SW1 + x[Nu-2] * SW2 + x[Nu-4] * SW3 + x[Nu-6] + RND_UP)
>> 5)

    for(j = 0 j < Nu j++)
        x[j] = CLIP(y[j])
}
```